CHAPTER 3
UNDERGROUND STORAGE TANKS

This chapter summarizes:

- Regulations for underground fuel storage tanks
- Prevention of spills, overfills, and corrosion
- Leak detection options

3.1 Introduction

The Resource Conservation and Recovery Act (RCRA) of 1976 required the U.S. Environmental Protection Agency (EPA) to develop a program for **underground storage tanks (USTs)** storing petroleum products. Based on this mandate, federal regulations were written to describe performance standards for USTs, how to prevent contamination of soil and groundwater by leaking USTs (LUSTs), how to properly close tanks, and what to do if a release occurs. You can find these regulations in Title 40 of the *Code of Federal Regulations*, Part 280 (40 CFR 280). The EPA proposed changes to the UST regulations in November 2011 that are expected to be finalized in the summer of 2014. Be sure to comply with a current copy of 40 CFR 280; see *Section 3.8, For More Information,* for a link to EPA's website.

The requirements of 40 CFR 280 apply to USTs that contain regulated substances and petroleum that have 10 percent or more of their volume (including the volume of connected underground pipes) below ground. Field-constructed USTs usually contain over 50,000 gallons and include cut-and-cover tanks. EPA has deferred these tanks from most Part 280 requirements. However, 40 CFR 280 Subpart F, which covers release response and corrective action, applies to field-constructed USTs. Oil/water separators that are regulated under a wastewater permit are excluded from the UST regulations. For a list of other exempt tanks, see *Appendix 3-1*.

EPA defines **regulated substances** as any Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) hazardous substances (except for hazardous waste) and petroleum (including blends such as motor fuels, jet fuels, distillate fuel oils, lubricants, petroleum solvents, and used oils). The CERCLA list of hazardous substances can be found in 40 CFR 302.4.

The Law Says…

- All USTs must have equipment for spill and overfill prevention, leak detection, and corrosion protection (40 CFR 280 Subpart C and D).
- Only trained personnel who follow standard procedures may install new tanks or close existing tanks (40 CFR 280.20[e]).
- You must comply with Spill Prevention, Control, and Countermeasure (SPCC) Plan requirements if you have at least 42,000 gallons of UST capacity, or have at least 1,320 gallons of aboveground storage tank oil capacity in 55-gallon or larger containers (40 CFR 112.1).
- The Energy Policy Act of 2005 significantly affected the federal UST program and required major changes to state programs. The Act focused on preventing releases and directed EPA to help states comply with new UST requirements. Among other things, it expands eligible uses of the Leaking Underground Storage Tank Trust Fund, and includes provisions regarding inspections, operator training, delivery prohibition, secondary containment within 1,000 feet of an existing community water system or well, and cleanup of releases that contain oxygenated fuel additives.

3.2 Requirements for USTs

USTs and their associated piping must comply with specific design, construction, installation, operating, and release detection requirements. For information on piping requirements, see *Chapter 5, Piping and Pipelines*.

3.2.1 Corrosion Protection

To help prevent corrosion, make sure you install only well-designed and well-constructed tanks. Unprotected steel corrodes and can release product (fuel)

from holes that begin as pitting on the metal surface. Unless noncorrosive soil conditions exist at your facility, you must protect from corrosion by doing at least one of the following:

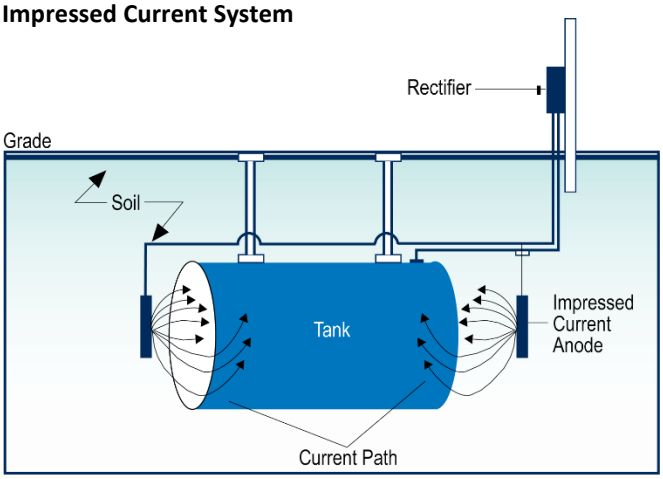
- Use tanks of noncorrodible materials, such as fiberglass-reinforced plastic (FRP) or a steel-FRP composite
- Protect steel tanks by coating them with a suitable nonconducting material and use a **cathodic protection** system (with **impressed current** or sacrificial anode, as described below)
- Get approval from your regulatory agency for another corrosion protection method that is equally safe (new techniques are emerging)

Don't Forget...

For the latest information on the status of the UST programs where you live, click on the EPA link below. This link provides state (or regional) contact information, plus up-to-date data on the UST system universe in each state (or region) as well as the status of implementing various national program initiatives.
http://www.epa.gov/oust/wheruliv.htm

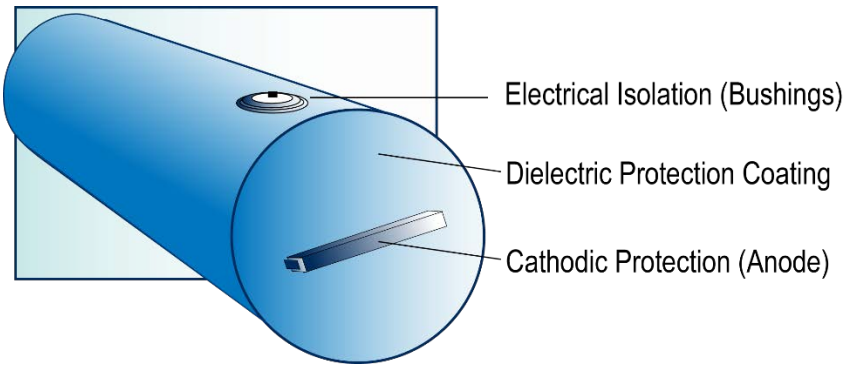
An impressed current system uses a **rectifier** to convert alternating current to direct current *(see Exhibit 3-1)*. This current is sent through an insulated wire to the "anodes," which are special metal bars buried in the soil near the UST. The current then flows through the soil to the UST system, and returns to the rectifier through an insulated wire attached to the UST. The UST system is protected because the current going to the UST system overcomes the corrosion-causing current normally flowing away from it.

EXHIBIT 3-1
Impressed Current System



Another type of cathodic protection is called a **sacrificial anode** or galvanic anode system *(see Exhibit 3-2)*. The galvanic anode system relies on the natural potential difference between the metallic sacrificial anode (usually aluminum, magnesium, or zinc) and the steel tank to provide a protective flow of current. Metal ions migrate from the more reactive metal anode to the tank and, in the process, the anodes corrode (are sacrificed).

EXHIBIT 3-2
Sacrificial Anode System

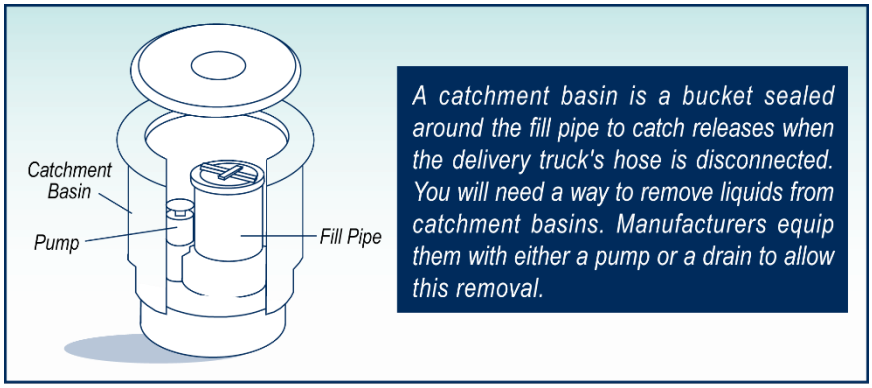


Only a qualified cathodic protection expert can determine what kind of cathodic protection will work at your UST site.

3.2.2 Spill and Overfill Prevention Equipment

To prevent spills and accidental overfills associated with product transfers, you must use spill prevention equipment, such as a spill catchment basin (see *Exhibit 3-3*), and overfill prevention equipment, such as automatic shutoff devices, overfill alarms, and ball float valves (fitted to the vent pipe) (see *Exhibit 3-4*). Alternative spill and overfill prevention equipment that is equally safe may be used with regulatory agency approval.

EXHIBIT 3-3
Spill Catchment Basin



3.2.3 Installation of USTs

All tanks and piping must be properly installed according to a nationally recognized code of practice and according to the manufacturer's instructions. Use a qualified installer or have the installation inspected by a licensed Professional Engineer or the regulatory agency, and certify the installation method used on the appropriate agency notification form.

3.3 General UST Operating Requirements

New and upgraded USTs are a collection of mechanical and electronic devices that can fail under certain conditions. These failures can be prevented or quickly detected by following general UST operating requirements. Having a new or upgraded UST system is a good start, but the system must be properly operated and continuously maintained to ensure that leaks are avoided or quickly detected.

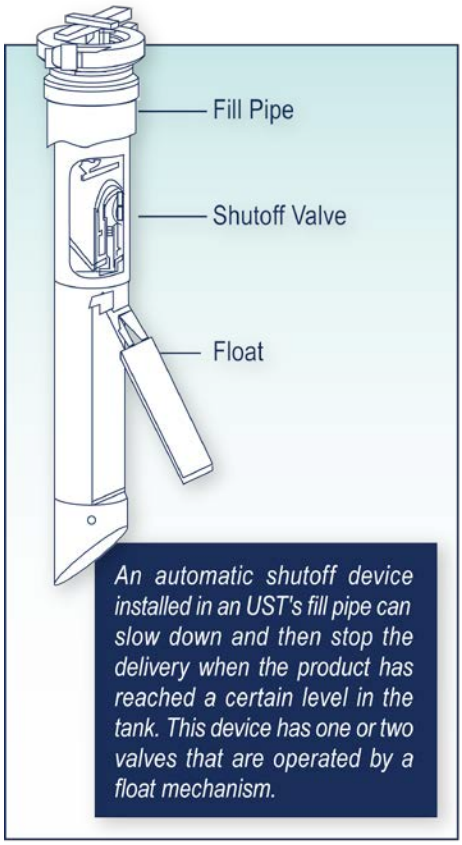
3.3.1 Spill and Overfill Control

To prevent spills and overfills, use correct filling practices when transferring product. Make sure there is room in the tank before delivery, and watch the entire delivery. Report, investigate, and clean up any spills and overfills accordingly.

3.3.2 Operation and Maintenance

Conduct all UST system repairs according to a nationally recognized code of practice, and meet the following requirements:

EXHIBIT 3-4
Automatic Shutoff Device



- Ensure continuous operation of corrosion-protection systems for tanks that routinely contain product.
- Have all cathodic protection systems tested by a qualified cathodic protection tester within 6 months of installation and at least every 3 years thereafter.
- Inspect impressed current cathodic protection systems (the rectifier) every 60 days to ensure that the equipment is working properly.
- Replace corroded or damaged metal fittings that have released product. Fiberglass fittings may be repaired according to manufacturer's specifications.
- Tightness-test repaired tanks and piping within 30 days of the repair.
- Test cathodically protected UST systems within 6 months of repair.

3.3.3 UST Leak Detection

All USTs systems must have a method of leak detection. Use one, or a combination, of the following monitoring methods *monthly*:

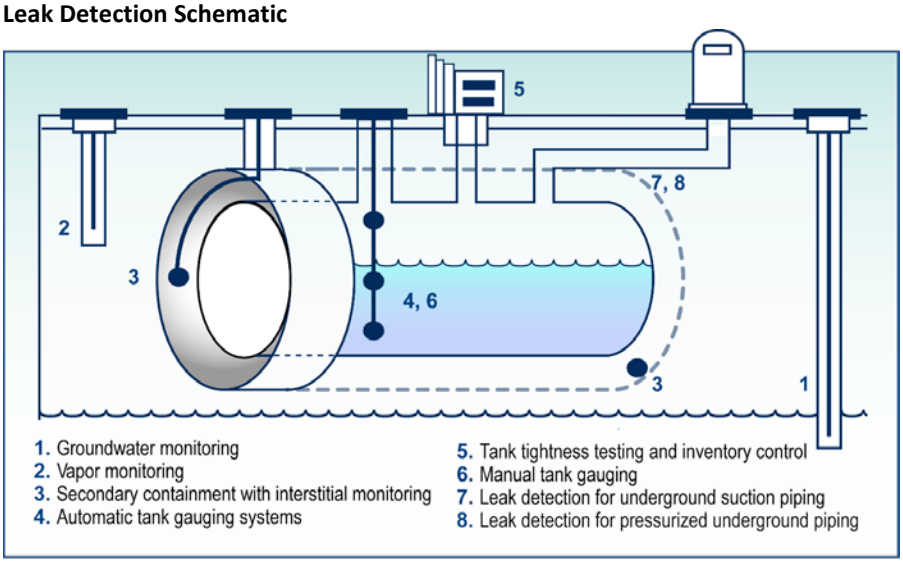
- Vapor monitoring in soil
- **Interstitial monitoring** (measuring liquids in the space between a tank and its outer containment wall)
- Automatic tank gauging
- Groundwater sampling from nearby monitor wells
- Statistical inventory reconciling
- Other regulatory-approved methods

Don't Forget...

Make sure the vendor of the leak detection method you use has given you documentation that your leak detection system meets regulatory requirements for performance.

EPA allows facilities to use manual tank gauging as the sole method of leak detection for small USTs (under 550 gallons). *Exhibit 3-5* shows typical leak detection methods. Other methods can be used if they meet a performance standard of detecting a leak of 0.2 gallons per hour with a probability of detection of at least 95 percent and a probability of false alarm of no more than 5 percent. EPA has developed evaluation procedures for innovative leak detection systems to be reviewed by an independent third party. You should obtain a signed certification from the leak detection vendor that the system meets the regulatory performance requirements, as well as documenting any limitations of the system.

EXHIBIT 3-5
Leak Detection Schematic



States are able to implement regulations equal to or more restrictive than the federal regulations noted above. Therefore, it is important to find out if there are state or local agency requirements on the use of leak detection methods for USTs that differ from those described here. For example, California requires owners/operators of UST systems installed before July 1, 2003, and located within 1,000 feet of a public drinking water well to perform enhanced leak detection. Enhanced leak detection is a test method that introduces a chemical additive not normally found in the fuel into the tank, and then monitors for that additive outside the tank walls.

3.3.4 Recordkeeping and Reporting

You must submit the following information to your regulatory agency:

- A notification form within 30 days of an UST first being used. Note that many states, such as Florida, require notification before tank installation.
- Reports of all suspected releases, spills, and overfills exceeding 25 gallons or that cause a sheen on surface water, and confirmed releases within 24 hours.
- A report summarizing the initial cleanup measures taken within 20 days of a confirmed release.

Exhibit 3-6 lists the documentation that must be kept onsite and for how long. These records are to be readily available for state agency inspection.

Don't Forget...

Most states require the UST Registration Form to be updated for system changes including the type of regulated substance. Converting an UST to contain alternative fuels will likely require updating the registration.

EXHIBIT 3-6
UST Recordkeeping Requirements

Documentation	How Long To Keep
UST registration or notification forms	Life of the tank
A corrosion expert's analysis of site corrosion potential, if corrosion protection equipment is not used	Life of the tank
Results of cathodic protection system inspections (every 3 years)	Keep the two most recent inspections; for impressed current system, keep the past three inspection records.
Documentation of UST system repairs or upgrades	Life of the tank
Leak detection system documentation:	
Performance claims and schedules of required calibration and maintenance	5 years from date of installation
Calibration, maintenance, and repair documentation	At least 1 year
Sampling, testing, gauging, or monitoring results	At least 1 year
Tank tightness test results	Until next test conducted
Site assessment records and closure reports	3 years after closing an UST (note: some states require longer storage times)

3.4 Biofuel Blend Compatibility for USTs

The chemical and physical properties of biofuels, such as ethanol and biodiesel, may make them more aggressive to certain UST system materials than petroleum. So it's important that all UST system components in contact with ethanol or biodiesel blends are materially compatible with that fuel. EPA published guidance in the July 5, 2011, *Federal Register* regarding compatibility of UST systems with biofuel blends. To be in compliance with 40 CFR 280.32, owners and operators of UST systems storing ethanol-blended fuels greater than 10 percent ethanol or biodiesel-blended fuels greater than 20 percent biodiesel must use compatible equipment. EPA considers the following UST components to be potentially susceptible to compatibility issues:

- Tank or internal tank lining
- Piping
- Line leak detector
- Flexible connectors
- Drop tube
- Spill and overfill prevention equipment
- Submersible turbine pump and components
- Sealants (including pipe dope and thread sealant), fittings, gaskets, O-rings, bushings, couplings, and boots
- Containment sumps (including submersible turbine sumps and under dispenser containment)
- Release detection floats, sensors, and probes
- Fill and riser caps
- Product shear valve

Here are some acceptable methods for owners and operators of UST systems storing ethanol-blended fuels greater than 10 percent ethanol or biodiesel-blended fuels greater than 20 percent biodiesel to demonstrate compatibility under 40 CFR 280.32:

- Use components that are certified or listed by a nationally recognized, independent testing laboratory (for example, Underwriters Laboratories) for use with the fuel stored.
- Use components approved by the manufacturer to be compatible with the fuel stored. EPA considers acceptable forms of manufacturer approvals to:
  - Be in writing
  - Indicate an affirmative statement of compatibility
  - Specify the range of biofuel blends the component is compatible with
  - Be from the equipment manufacturer, not another entity (such as the installer or distributor)
- Use another method determined by the implementing agency to sufficiently protect human health and the environment. EPA will work with states as they evaluate other acceptable methods.

Don't Forget...

Underground product recovery tanks also need to comply with UST requirements in this chapter.

3.5 Leaking USTs

3.5.1 Spills, Overfills, and Confirmed Releases

If you have a confirmed petroleum release to groundwater, surface water, or soil, you must report it to the state or federal agency in charge of the UST program. You're required to report within 24 hours or possibly immediately depending on the agency requirements. Spills and overfills resulting in a petroleum release to the environment of over 25 gallons must also be reported (and cleaned up immediately). In addition, if your UST stores a hazardous substance, instead of petroleum, and there is a release to the environment exceeding that substance's **reportable quantity (RQ)** it must be reported to the UST program as well as the National Response Center (NRC). See *Chapter 2, Incident and Spill Reporting*, for release reporting requirements and an explanation of RQs. For corrective actions, see *Chapter 8, Assessment and Cleanup*.

Did You Know?

The UST program defines USTs differently than the SPCC rule does. The UST Program considers an underground storage tank to be a tank and any underground piping that has at least 10% of its combined volume underground. However, under the SPCC rule, only completely buried tanks subject to the technical UST Program requirements are exempt from the rule. Any tanks that are not completely buried are considered aboveground storage tanks and subject to the SPCC rule.

3.5.2 Suspected Releases

You must immediately investigate and confirm all suspected releases from USTs within 7 days. Conduct **tank tightness testing** to determine whether a leak exists. If test results indicate a leak, you must repair, replace, or upgrade the tank and begin corrective actions as described in *Chapter 8, Assessment and Cleanup*. If the test results do not indicate a leak and environmental contamination was not the reason for suspecting a release, no further investigation is required.

3.6 Tank Closure

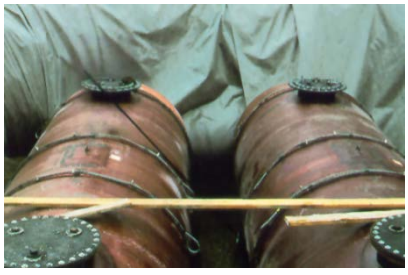
Many people have been killed or injured while improperly closing or removing USTs. As described below, the regulations in 40 CFR 280 specifies the following closure requirements for USTs:

For **temporary closure** (for example, out-of-service tanks) of 12 months or less:

- Continue to use corrosion protection and leak detection systems during non-use time (omit leak detection if the tank is empty).
- Leave vent lines open and functioning.
- Cap all other lines, pumps, manways, and ancillary equipment.

For **permanent closure**:

- Notify your regulatory agency 30 days before closure.
- Conduct a site assessment to determine if a leak has occurred, and take corrective actions if needed (see *Chapter 8, Assessment and Cleanup*).
- Use standard safety and disposal practices to remove remaining liquids and accumulated sludge. Use only trained personnel who follow accepted safety practices.
- Fill the cleaned tank with a harmless, inert solid material (such as sand) and leave the tank in place. Or excavate the emptied tank and dispose of it properly. Note that some states require removal of the tank.
- Keep the certified closure report on file for at least 3 years.



Note that some states require trained and certified workers to perform certain phases of UST work, such as closure.

State Requirements

3.7 State Requirements

Currently 38 states have EPA approval to administer the UST program: Alabama, Arkansas, Colorado, Connecticut, Delaware, Georgia, Hawaii, Idaho, Indiana, Iowa, Kansas, Louisiana, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Mexico, North Carolina, North Dakota, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, and West Virginia. Many states have adopted UST requirements that more strict than the federal rules. Be sure to check your state UST regulations for more stringent requirements. See *Appendix E* for a list of regional EPA and state contacts for USTs and LUSTs.

Some examples of differing state requirements are:

- Connecticut, Idaho, Illinois, Rhode Island, Vermont, and Wisconsin have more stringent or differing release detection testing requirements.
- Missouri requires all metal components in contact with an electrolyte including but not limited to soil, backfill, and/or water to be cathodically protected.
- Wisconsin has more stringent requirements for overfill prevention equipment.
- In California, service activities related to UST monitoring system equipment, such as servicing electronic consoles for leak detection monitoring, must be performed by a qualified service technician meeting specific licensing and training requirements.
- The following states provide biofuel storage guidance or have application processes for approval of storing biofuel in USTs: Arizona, California, Colorado, Delaware, Iowa, Maryland, Minnesota, Missouri, New Hampshire, North Carolina, Oregon, South Carolina, Tennessee, Vermont, Washington, and Wisconsin.
- Note that some states (for example, Georgia and Alabama) require that closure assessments be submitted to the state agency.

Did You Know?

As a result of the Energy Policy Act of 2005, most states receiving federal money made significant changes that affect owners or operators of UST:

- *Established minimum requirements for delivery prohibition*
- *Required state agency UST inspections every 3 years*
- *Secondary containment and interstitial monitoring for new and repaired UST systems within 1,000 feet of a community water supply system operator training*

Check your state regulations for these requirements.

For More Information

3.8 For More Information

For Information On…	See…
UST Related Agencies	
Directory of State UST Program Contacts	www.epa.gov/oust/states/statcon1.htm
EPA's Office of Underground Storage Tank (OUST)	1200 Pennsylvania Ave. NW (5401G) Washington, DC 20460 (703) 603-9900 www.epa.gov/oust or www.epa.gov/swerust1/cmplastc/index.htm for the compliance assistance section
November 2011 Proposed Rule to Revise Underground Storage Tank Regulations (expected to be finalized summer 2014)	http://www.epa.gov/OUST/fedlaws/proposedregs.html
Tanks Subcommittee of the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), Tanks Subcommittee	www.astswmo.org

For Information On…	See…
Tank Related Professional and Trade Associations	
American Petroleum Institute (API)	www.api.org
American Society for Testing and Materials (ASTM)	www.astm.org
Fiberglass Tank and Pipe Institute (FTPI)	www.fiberglasstankandpipe.com
NACE International – The Corrosion Society	www.nace.org
National Fire Protection Association (NFPA)	www.nfpa.org
Petroleum Institute (PEI)	www.pei.org
Steel Tank Institute (STI)	www.steeltank.com
Underwriters Laboratories (UL)	www.ul.com
American Society of Mechanical Engineers (ASME)	www.asme.org
American Society of Nondestructive Testing (ASNT)	www.asnt.org
American Welding Society (AWS)	www.aws.org
Documents and References	
Biofuels	https://www.federalregister.gov/articles/2011/07/05/2011-16738/compatibility-of-underground-storage-tank-systems-with-biofuel-blends#h-12
Various publications related to USTs by U.S. EPA	www.epa.gov/OUST/pubs/index.htm
UST Technical Compendium (interpretations and guidance letter by the OUST	www.epa.gov/oust/compend/index.htm
Industry Codes and Standards for UST Systems	www.epa.gov/oust/cmplastc/standard.htm
Petroleum Vapor Intrusion Compendium	www.epa.gov/oust/cat/pvi/index.htm

Action Items

3.9 Action Items

Item	Date Started	Date Completed	N/A	Comment(s)
Obtain and be familiar with your state UST regulations.			☐	
Verify that your liquid storage tanks meet industry standards for design, construction, alterations, and repairs.			☐	
Register your tank systems with a regulatory agency.			☐	
Test your tanks for integrity to prevent accidental failures.			☐	
Prepare contingency and response plans to prevent releases, and establish a plan of action in the event of a tank failure.			☐	
Train your staff in spill prevention and release response.			☐	
Routinely inspect your tank systems and secondary containment for actual or potential product releases.			☐	
Manage tank system wastes properly (including bottom water, removed paint, etc.); they may be considered hazardous waste.			☐	
Notify and report to regulatory agencies if a release is detected.			☐	
Maintain records of training, inspections, tank testing, registrations, self-inspections, etc. to prove compliance.			☐	

Chapter 3 Appendices

Appendix 3-1 Exempt Underground Storage Tanks

Appendix 3-1: Exempt Underground Storage Tanks

Note: Below are the federal exemptions and deferrals from regulations. Always check with your state agency because some states do not adopt these exemptions and deferrals in their regulations.

Tanks Not Governed by Regulations in 40 CFR 280.10 (however, some of these tanks may be regulated by SPCC rules)

- Any UST system, including sumps, less than or equal to 110 gallons
- Farm or residential tanks of 1,100 gallons or less used for storing motor fuel for non-commercial use
- Tanks used for storing heating oil for consumptive use on the premises where stored
- Septic tanks
- Pipeline facility regulated under Natural Gas Pipeline Safety Act of 1968 or the Hazardous Liquids Pipeline Safety Act of 1979, or that is an intrastate pipeline facility
- Surface impoundment, pit, pond, or lagoon
- Storm water or wastewater collection system
- Flow-through process tank
- Liquid trap or associated gathering lines directly related to oil or gas production and gathering operations
- Storage tanks located in an underground area but placed on the floor (basement, cellar, etc.)
- UST systems storing hazardous waste that are regulated under RCRA
- Wastewater treatment tanks and **oil/water separators** that are part of a wastewater treatment facility regulated under Section 402 or 307 (b) of the Clean Water Act (CWA)
- USTs containing *de minimis* concentrations of regulated substances
- Emergency spill or overflow containment UST systems that are expeditiously emptied after use
- Equipment or machinery that contains regulated substances for operational purposes, such as hydraulic lift tanks and electrical equipment tanks

Deferral from Some of the Regulations

Requirements in 40 CFR 280 for UST design installation, operation, release detection, and reporting do not apply to:

- Wastewater treatment tank systems
- UST systems containing radioactive material regulated under the Atomic Energy Act of 1954
- Airport hydrant fuel distribution systems
- UST systems with field-constructed tanks

Release detection requirements do not apply to:

- Any UST storing fuel solely for use by emergency generators

Note: EPA proposed changes to the UST regulations in November 2011 that are expected to be finalized in the summer of 2014. Among other items, the proposed changes would require previously deferred UST systems (e.g., airport hydrant fuel distribution systems, UST systems with field-constructed tanks, and wastewater treatment tanks) as well as USTs that store fuel solely for use by emergency power generators to come into compliance with new requirements according to a specific schedule.